CLAIMS

1. A stator assembly comprising:

a) a stator having multiple conductors that create a plurality of magnetic fields when electrical current is conducted through the conductors and a core having a pair of opposing end surfaces in contact with each other forming a toroidal shape; and

b) a monolithic body of phase change material substantially encapsulating the conductors and the core and holding said core in a toroidal shape.

2. The stator assembly of claim 1 wherein the conductors comprise wire windings and the packing density of the wire is between about 60 percent and about 80 percent.

3. The stator assembly of claim 1 wherein the stator is made from metal laminations and the grain structure of the metal in each lamination is oriented in the same general direction.

4. The stator assembly of claim 3 wherein the phase change material has a coefficient of linear thermal expansion that is similar to the coefficient of linear thermal expansion for the metal laminations.

5. The stator assembly of claim 1 wherein the phase change material has a coefficient of linear thermal expansion of less than $2x10^{-5}$ in/in/°F throughout the range of 0-250°F.

6. The stator assembly of claim 1 wherein the phase change material has a coefficient of linear thermal expansion of less than $1.5x10^{-5}$ in/in/°F throughout the range of 0-250°F.

7. The stator assembly of claim 1 wherein the phase change material has a coefficient of linear thermal expansion of between about $0.8x10^{-5}$ in/in/°F and about $1.2x10^{-5}$ in/in/°F throughout the range of 0-250°F.

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8. The stator assembly of claim 1 wherein the phase change material has a thermal conductivity of at least 0.7 watts/meter°K at 23°C.

9. The stator assembly of claim 1 wherein the phase change material comprises polyphenyl sulfide.

10. A method of making a stator assembly for a motor comprising:

a) providing a linear stator core preform, wherein said core preform has a first end surface and a second end surface and poles extending along one side thereof;

b) winding wire around said poles;

c) forming a toroidal core by bringing the first end surface and the second end surface into contact with each other; and

d) substantially encapsulating said toroidal core and windings with a monolithic body of phase change material to form said stator assembly.

11. The method of claim 10 wherein said toroidal core is formed by rolling said core preform and clamping said core preform into an injection mold cavity to bring the first end surface and the second end surface into contact with each other.

12. The method of claim 11 wherein said rolling is performed by a roll forming machine that forms the toroidal core.

13. The method of claim 10 wherein said phase change material is selected from the group consisting of thermoplastics and thermosetting materials.

14. The method of claim 10 wherein said step of substantially encapsulating the core and wire windings is performed by injection molding said phase change material around said toroidal core.

15. The method of claim 14 wherein said phase change material is injected into a mold at a temperature in the range of about 200°F to about 700°F.

16. The method of claim 14 wherein said phase change material is injected into a mold at a temperature in the range of about 550°F to about 650°F.

17. A method of making a motor comprising:

a) providing a linear core preform having two end surfaces and a plurality of poles extending from one side;

b) winding wire around said poles;

c) forming a toroidal core by bringing the two end surfaces of the core preform adjacent to each other;

d) clamping said toroidal core in an injection mold cavity to hold the toroidal shape;

e) injection molding phase change material around said toroidal core to substantially encapsulate said toroidal core with a monolithic body of phase change material to form a stator assembly; and

f) constructing the stator assembly into a motor.

18. The method of claim 17 wherein said toroidal core is formed by rolling said core preform and clamping said core preform into an injection mold cavity to bring the two end surfaces into contact with each other.

19. The method of claim 18 wherein said rolling is performed by a roll forming machine to form the toroidal core.

20. A motor made from the stator assembly of claim 1.

21. The motor of claim 20 wherein said motor comprises a stator assembly, a shaft, a base, bearing, and a hub.

22. An electronic device having the motor of claim 20.

23. A motor and disc assembly having the motor made by the method of claim 17.

24. A linear core preform comprising:

a) a plurality of strips of metal laminated together, the laminated strips having a plurality of poles extending from a side thereof, wherein wire is wound on said poles; and a base, wherein said base is formed by laminating a plurality of metal strips.

25. The linear core preform of claim 24 wherein the packing density of said wire is about 60 percent to about 80 percent.

26. An encapsulated stator comprising:

a) a stator having multiple conductors that create a plurality of magnetic fields when electrical current is conducted through the conductors and a core having a pair of opposing end surfaces in contact with each other forming a toroidal shape; and

b) a monolithic body of phase change material substantially encapsulating the conductors and the core.